DIR-1094

CTD Data from the DUMAND Deployment Cruise **UWA-DUMAND-94-02**

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I. Seabird SBE-16 CTD Data

During DUMAND-II deployment operations on 12/14/93, the Seabird CTD (Model SBE-16, SN 165492-1044) provided data for a sound velocity parameter profile over the site. Following landing, a 2-hour time series of C,T,P was logged at depth. The CTD is mounted on the JB string, approximately 10m above the ocean bottom when the string is upright. The actual height with the string top still attached to the sacrificial anchor is not known. The amount of tilt observed should not affect CTD accuracy.

The raw hex data file as received from the CTD unit has been converted into standard oceanographic parameters (pressure, temperature, salinity, depth and sound speed) using reduction algorithms supplied by Seabird. Depth is calculated from pressure by the Fofonoff method [1]. Conductivity, pressure and temperature data are used to calculate salinity according to the PSS-78 standard [2]. Sound speed is calculated from S,T and D using the conventional Wilson formula [3]. (In the figures I use v for sound speed instead of c to avoid confusion with conductivity).

Since data logging was interrupted by other activities during deployment, there are a few gaps in the profile; also due to occasional halts in the lowering operation, some data frames do not follow a monotone-increasing depth pattern. Therefore the following steps have been taken:

a) long patches of near-constant depth have been edited out of the file;

b) a standard cubic spline procedure (with "natural" ends) has been used to interpolate the gaps; the interpolating coefficients have been used to produced a table of sound speed vs depth at regular 5m intervals from the surface to 4730m (just above the final depth of the CTD).

c) the interpolated v vs depth table has been used to calculate an integrated mean sound speed for paths from the surface to 4730m.

Once the JB reached the ocean bottom, about 500 frames of data were taken at 15 sec intervals. These data have been used as a sample time series of ocean parameters; due to the relatively short time span they represent, the variances presumably provide information on the statistical precision of the CTD data rather than ocean characteristics.

The overall mean sound speed for a vertical path was computed by integrating the transit time between data points; values for the raw data set (with gaps) and the interpolated data set are listed in the table below.

II. Neil Brown Unit Data

The Neil Brown unit (EG&G model DRCM-2, SN 13-1091) provided T,D and current vector velocity data through the string controller at intervals during the deployment drop and for the short time after the drop when the string controller was operating. This unit does not have a conductivity sensor.

Samples were taken at approximately 20 second intervals once the string was on the bottom. Since we now believe the string was not vertical, but was arched over and still connected to the sacrificial anchor, it is possible the NBU was in a near-horizontal position while logging these data. Therefore it is not clear how much significance the current velocity data may have, for example.

TABLE: MEAN SOUND SPEED AND PARAMETER VALUES AT BOTTOM

Mean sound speed for a vertical path from surface to bottom:
from raw data file: = 1504.32
from interpolated (equally spaced 5m intervals) file: = 1504.42

Mean values and standard deviations for 474 readings at bottom:

depth:	4737.22	±0.6 meters
temperature:	1.508	±0.001 deg C
salinity:	34.677	±0.001 ppt
sound speed:	1537.05	±0.01 m/sec

REFERENCES

1. Saunders and Fofonoff, Deep Sea Research 23:109 (1976).

2. Perkin and Lewis, IEEE J. of Oceanic Eng. OE5:9 (1980).

3. W. D. Wilson, J. Acous. Soc. Amer. 32:1357 (1960).

FIGURES

1. Raw data for v after editing and including gaps.
2. Plot of interpolated table of equally spaced data points.
3. Raw data for temperature.
4. Comparison of '92 and '93 data for a) v, b) T, c) S vs depth.
5. Time series for calculated sound speed at the bottom from CTD data for a period of approximately 2 hrs. Variations are primarily due to small fluctuations in the temperature and pressure readings.
6. NBU temperature vs depth data.
7. NBU current speed distribution.
8. NBU current azimuth (0 deg = magnetic north) distribution.
9. NBU current azimuth and speed time series (sampling interval approximately 3/minute).

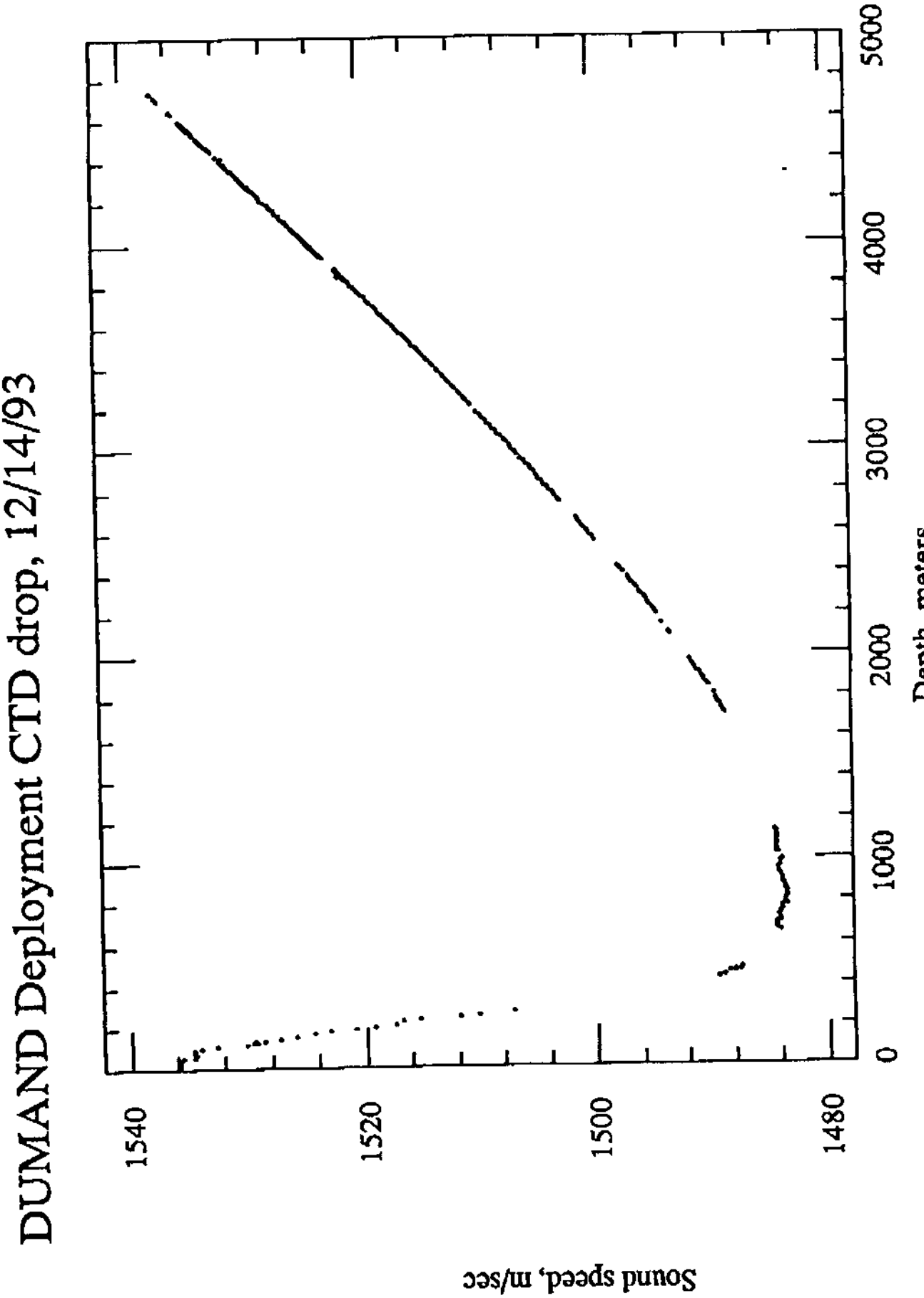

DUMAND Deployment CTD drop, 12/14/93
Sound speed, m/sec
1480
1500
1520
1540
0
1000
2000
3000
4000
5000
Depth, meters

FIG. 1

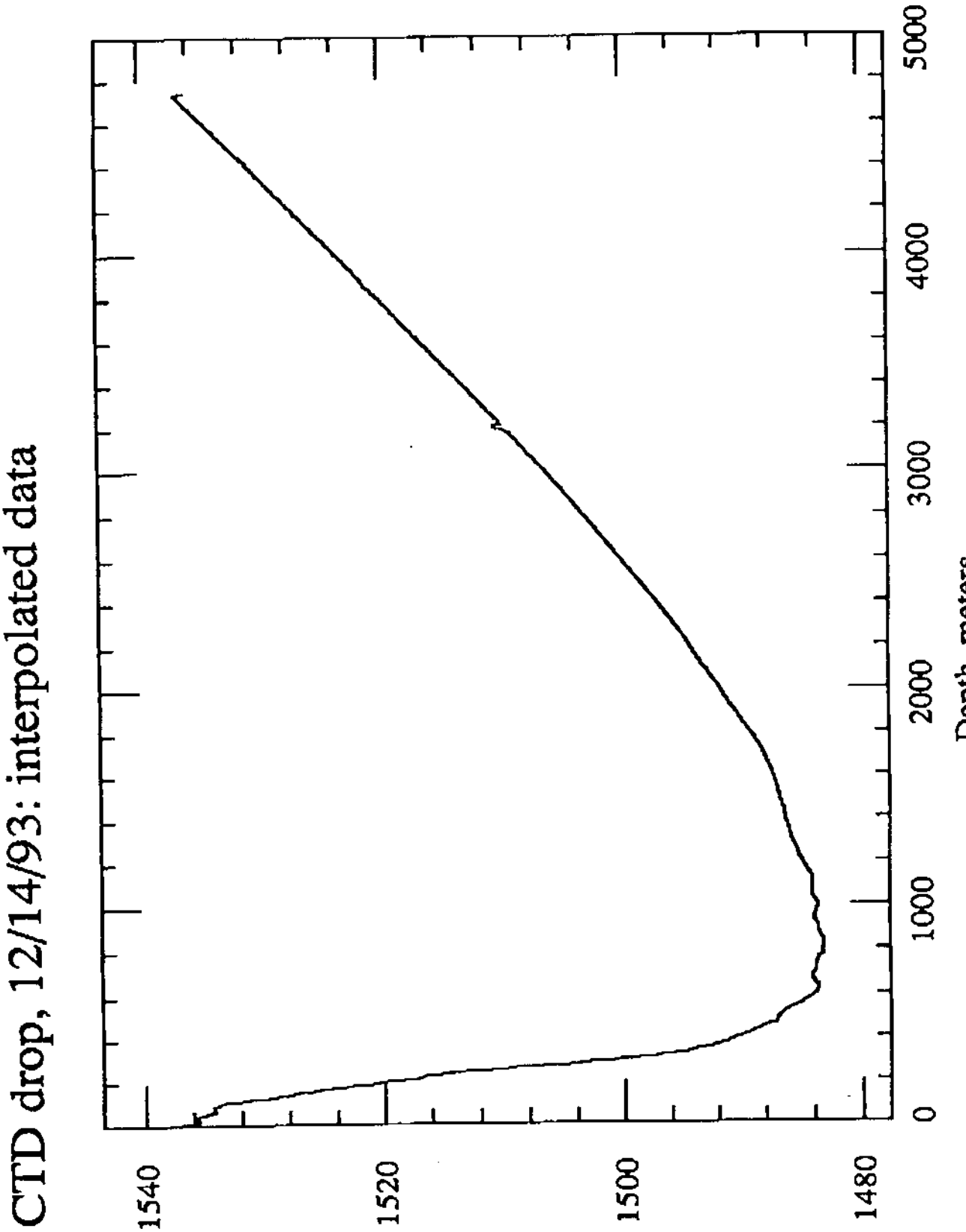

CTD drop, 12/14/93: interpolated data
Sound speed, m/sec
1480
1500
1520
1540
0
1000
2000
3000
4000
5000
Depth, meters

FIG. 2

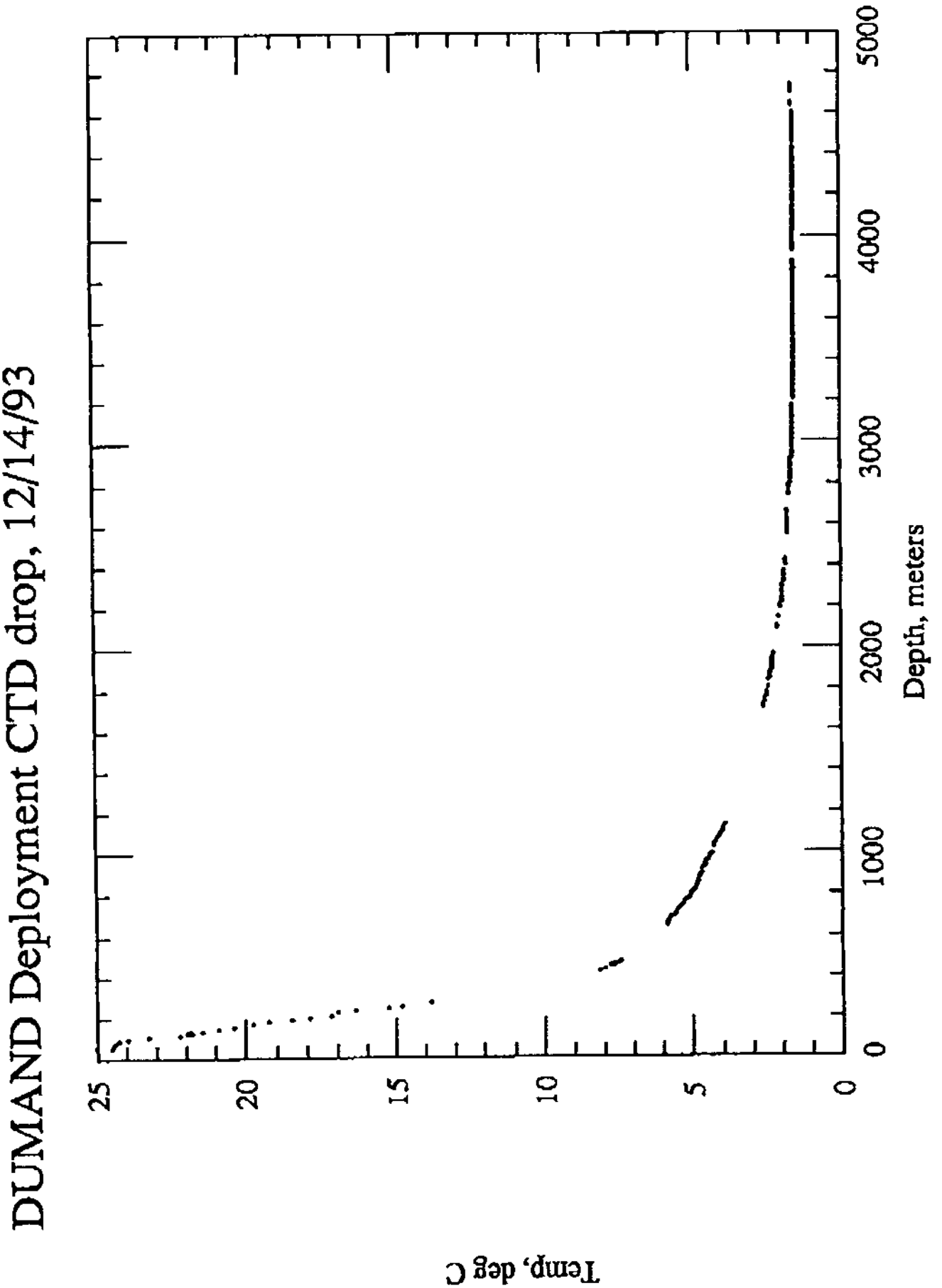

DUMAND Deployment CTD drop, 12/14/93
Temp, deg C
25
20
15
10
5
0
Depth, meters
0
1000
2000
3000
4000
5000

Fig. 3

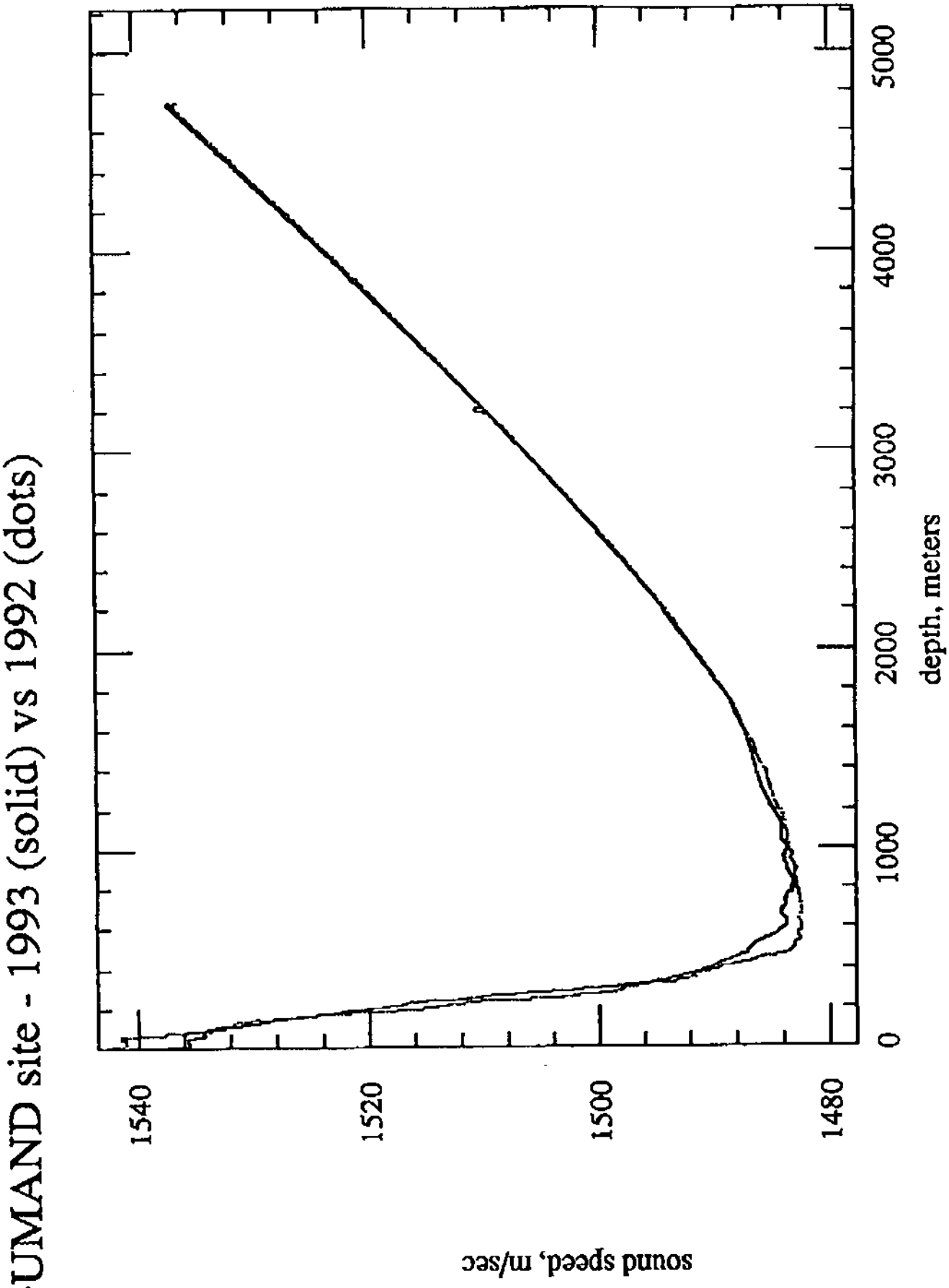

DUMAND site - 1993 (solid) vs 1992 (dots)
sound speed, m/sec
1540
1520
1500
1480
0
1000
2000
3000
4000
5000
depth, meters

Fig. 4a

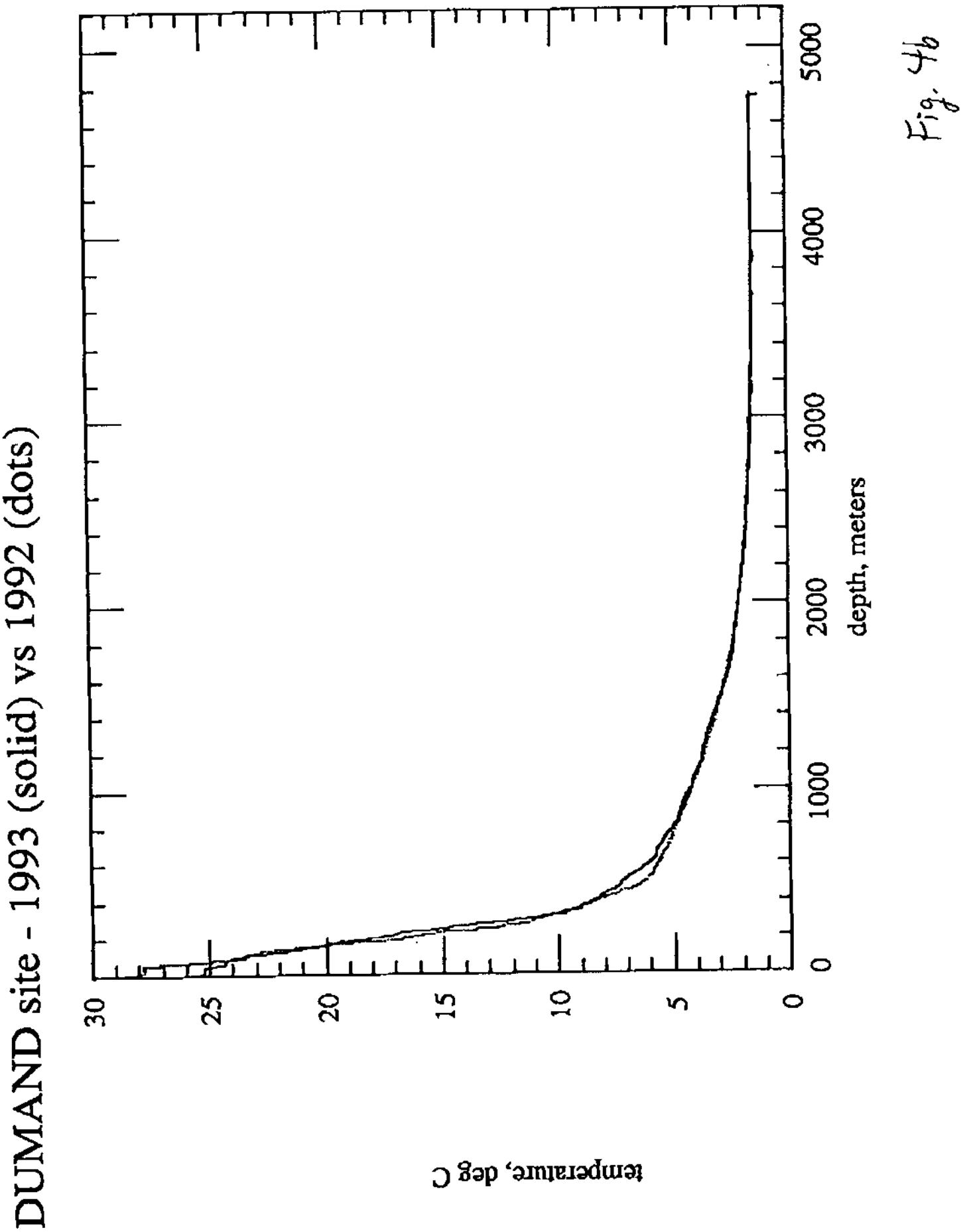

DUMAND site - 1993 (solid) vs 1992 (dots)
temperature, deg C
30
25
20
15
10
5
0
0
1000
2000
3000
4000
5000
depth, meters

Fig. 4b

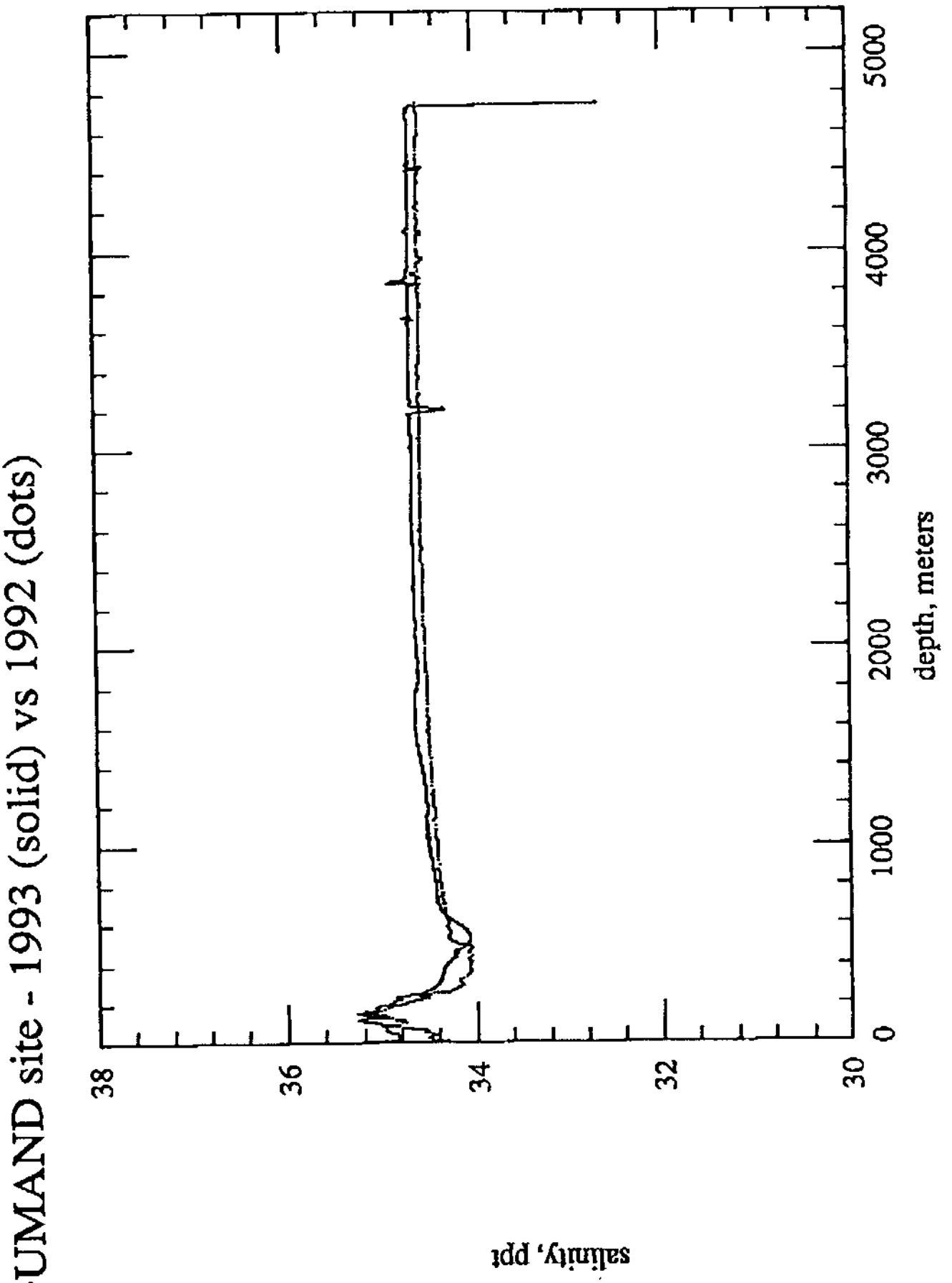

DUMAND site - 1993 (solid) vs 1992 (dots)
salinity, ppt
38
36
34
32
30
0
1000
2000
3000
4000
5000
depth, meters

Fig. 4c

Fig. 5

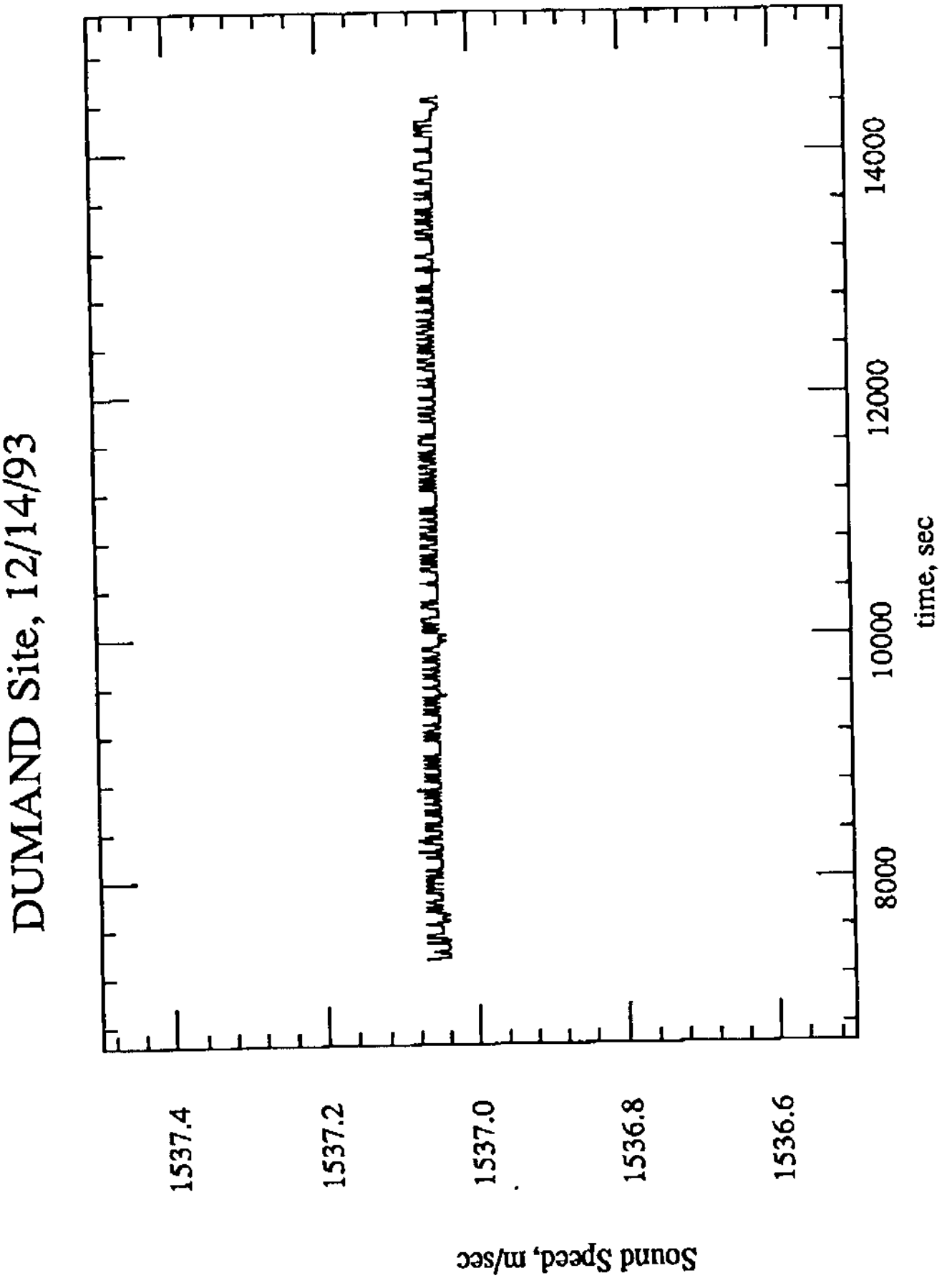
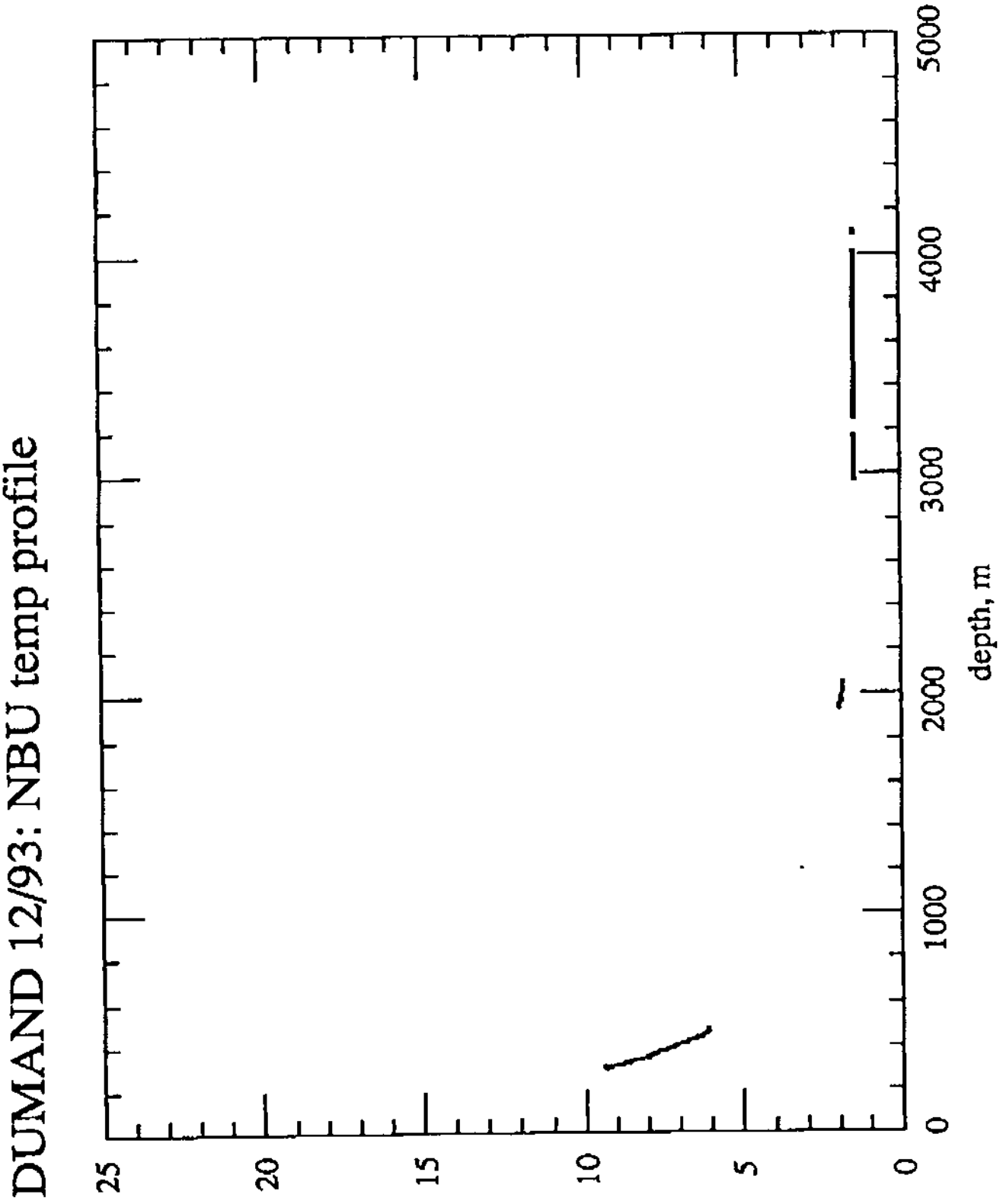

DUMAND Site, 12/14/93
Sound Speed, m/sec
1537.4
1537.2
1537.0
1536.8
1536.6
8000
10000
12000
14000
time, sec

Fig. 6


DUMAND 12/93: NBU temp profile
temp, deg C
depth, m
25
20
15
10
5
0
0
1000
2000
3000
4000
5000

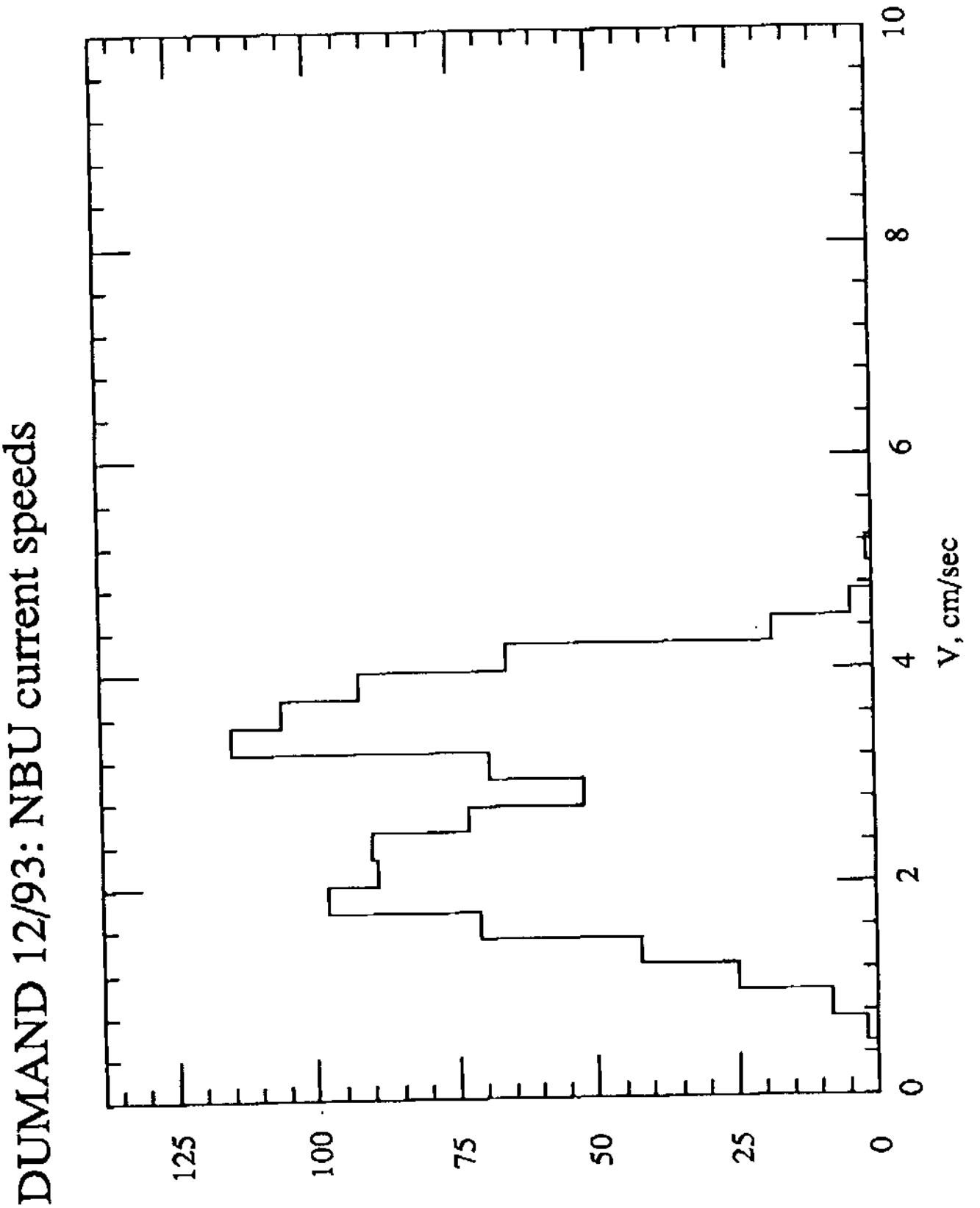

DUMAND 12/93: NBU current speeds
125
100
75
50
25
0
0
2
4
6
8
10
V, cm/sec

Fig 7

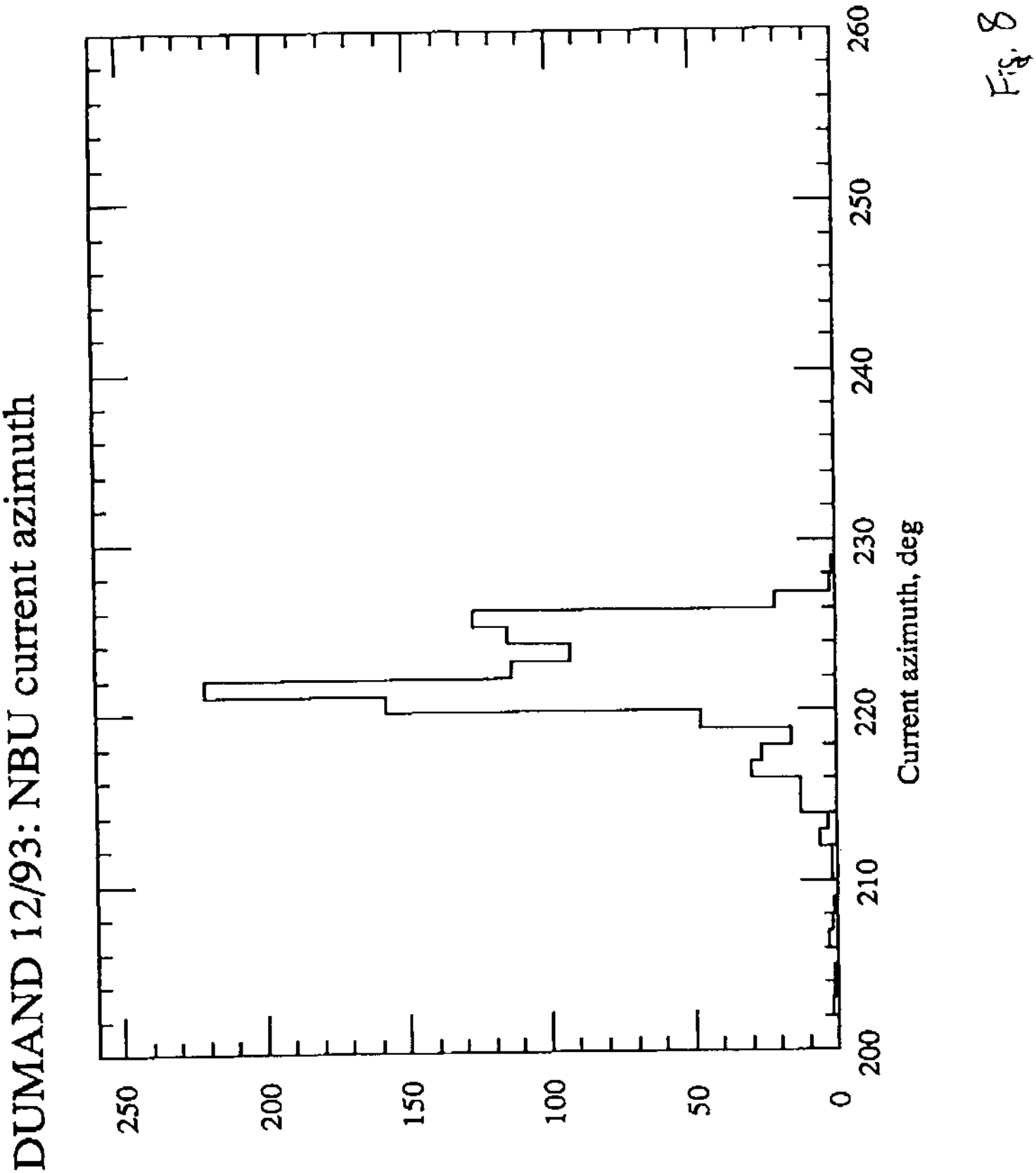
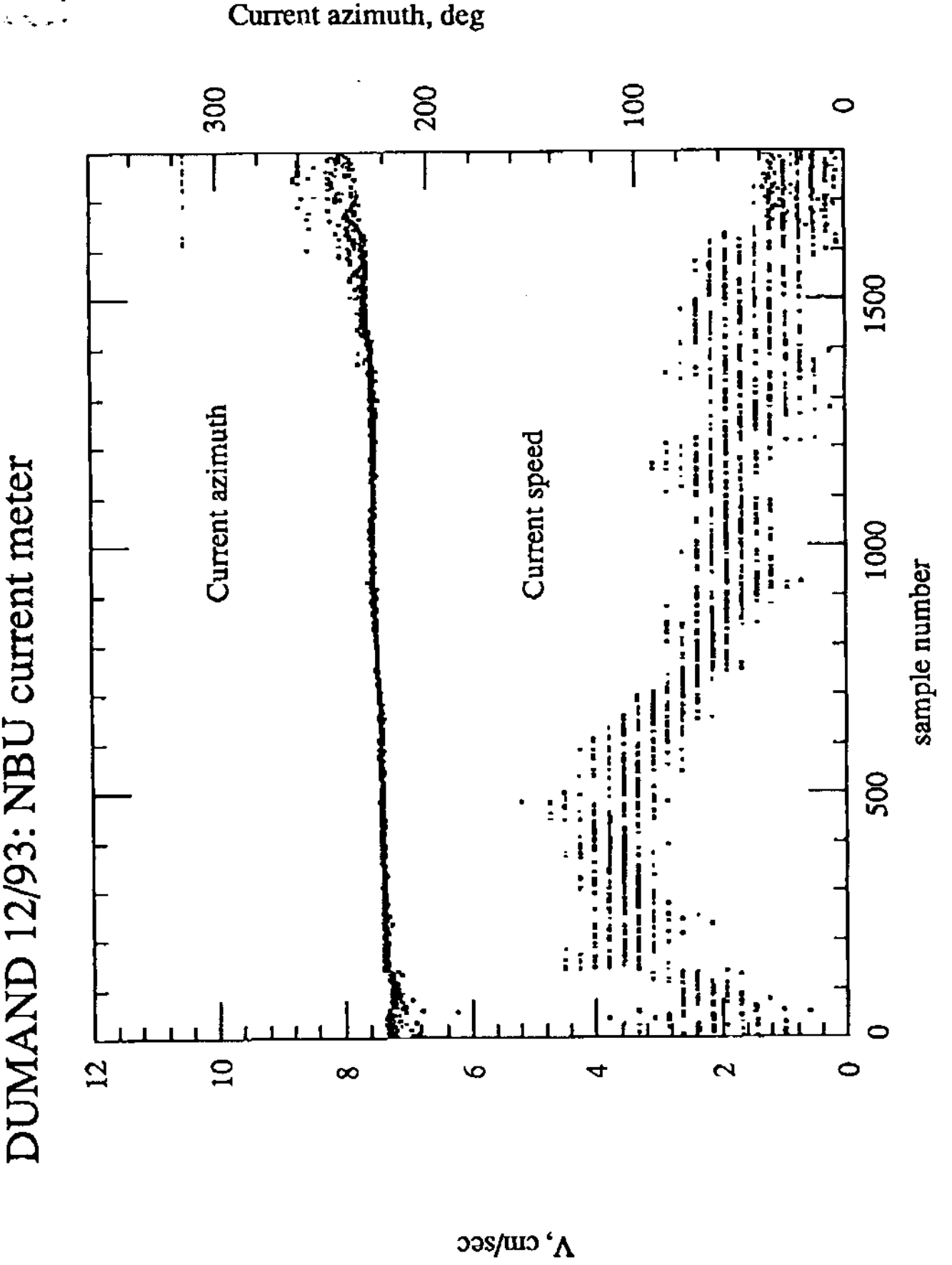

DUMAND 12/93: NBU current azimuth
250
200
150
100
50
0
200
210
220
230
240
250
260
Current azimuth, deg

Fig. 8


DUMAND 12/93: NBU current meter
Current azimuth, deg
300
200
100
0
Current azimuth
Current speed
12
10
8
6
4
2
0
0
500
1000
1500
sample number
V, cm/sec